

CLAIMS

What is claimed is:

1. An apparatus comprising:
a composite lid for a semiconductor package, wherein the composite lid comprises:
a first material; and
a second material, wherein the second material has a modulus of elasticity greater than the modulus of elasticity of the first material.
2. The apparatus of claim 1, wherein the first material comprises a portion of the lid adjacent to the die, and wherein the second material comprises a perimeter of the lid.
3. The apparatus of claim 1, wherein the first material comprises a portion of the lid adjacent to the die, and wherein the second material is situated in a corner of the lid.
4. The apparatus of claim 1, wherein the modulus of elasticity of the second material is at least twice the modulus of elasticity of the first material.
5. The apparatus of claim 4, wherein the first material has a thermal conductivity of at least about 250 W/mK.
6. The apparatus of claim 4, wherein the second material has a coefficient of thermal expansion of between about 4 ppm/°C and about 8 ppm/°C.

7. The apparatus of claim 1, wherein the first material is a material selected from a group consisting of copper and aluminum.
8. The apparatus of claim 1, wherein the second material is a material selected from a group consisting of copper-tungsten (Cu-87%W), tungsten, and silicon carbide.
9. The apparatus of claim 1, wherein a die is attached to the first material by a low-modulus thermal compound.
10. The apparatus of claim 9, wherein the thermal compound has a modulus of elasticity of less than 0.03 GPa.
11. A method of assembling a semiconductor die in a package, the method comprising:
 - interconnecting an active surface of the die with a package substrate;
 - applying an attach compound to a perimeter of the package substrate;
 - applying a low-modulus thermal compound to a back surface of the die; and
 - bonding a composite lid to the substrate and the back surface of the die, wherein the lid comprises a first material and a second material.
12. The method of claim 11, wherein:
 - the first material is bonded to the die; and
 - the second material is disposed towards a perimeter of the lid and bonded to the substrate.

13. The method of claim 12, wherein the second material has a modulus of elasticity greater than the modulus of elasticity of the first material.
14. The method of claim 13, wherein the second material extends throughout the height of the lid.
15. The method of claim 13, wherein the package substrate is comprised of alumina.
16. The method of claim 15, wherein the first material is a material selected from a group consisting of copper and aluminum.
17. The method of claim 16, wherein the second material is a material selected from a group consisting of copper-tungsten (Cu-87%W), tungsten and silicon carbide
18. The method of claim 17, wherein the thermal compound has a modulus of less than 0.03 GPa.
19. A packaged semiconductor device comprising:
 - an integrated circuit die including a bumped active surface and a back surface; and
 - a semiconductor package, wherein the package comprises:
 - a package substrate, wherein the active surface of the die is directly interconnected with the package substrate; and
 - a composite lid comprising at least two materials, wherein the back surface of the die is attached to the lid.

20. The packaged semiconductor device of claim 19, wherein the package is a land grid array (LGA) package.
21. The packaged semiconductor device of claim 19, wherein the composite lid comprises:
a first material; and
a second material, wherein the modulus of elasticity of the first material is less than the modulus of elasticity of the second material.
22. The packaged semiconductor device of claim 21, wherein the modulus of elasticity of the first material is less than half the modulus of elasticity of the second material.
23. The packaged semiconductor device of claim 21, wherein the first material comprises the area of the lid adjacent to the die, and wherein the second material is disposed near the perimeter of the lid and extends substantially throughout the height of the lid.
24. The packaged semiconductor device of claim 21, wherein the die is attached to the first material by a thermal compound having a modulus of elasticity less than about 0.03 GPa.